Alexander Steele

Software Engineer · UBC Computer Science and Physics

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Experience

Tesla, Inc.
Palo Alto, California

Crash Safety Software Engineer Intern
May 2023 – August 2023

- Developed **C** firmware for communication over the vehicle's controller area network, enabling full archival of crash data.
- Independently discovered and patched allocation inefficiency in **Rust** simulation codebase, improving runtimes by 30%.
- Optimized **Rust** data intake pipeline by hand-writing a parser, resulting in an 80% performance improvement.
- Wrote **Rust** software-in-the-loop (**SIL**) models and integration tests for inter-chip SPI communication and snooping.
- Ported internal hardware-in-the-loop (**HIL**) testing library to **Linux** and enabled firmware engineers to remotely execute tests using **Python**, **C**, **Docker**, and **Jenkins**.

Tesla, Inc.
Palo Alto, California

Crash Safety Software Engineer Intern
September 2022 – December 2022

- Designed and wrote SPI drivers to control the restraint control module's (RCM) inertial measurement units (IMUs) in **C**.
- Implemented numerical integral approximations for the RCM crash algorithm's near-deploy calculations in **C**.
- Created chip-level software-in-the-loop (**SIL**) models for the RCM's onboard IMUs with extensive fault-injection capabilities in **Rust** and **PyO3** and wrote SIL tests for drivers and crash algorithm using **PyTest**.
- Reduced hardware-in-the-loop (**HIL**) test execution time from 5.5 hours to 2 minutes and enabled the addition of the HIL test suite to continuous integration (CI) by automating test running using **Python** and **C**.

UBC Department of Computer Science
Vancouver, British Columbia

Lead Undergraduate Teaching Assistant
January 2020 – Present

- Maintains **Racket** autograder server used by over 800 students to submit and receive feedback on over 1500 files daily.
- Improves students' engagement by providing personalized feedback using applications developed in **Python** and **Bash**.
- Detected over 200 cases of academic misconduct by designing, implementing, and deploying novel code-similarity algorithm using **Rust**, **Python**, and **TensorFlow**.
- Supervises three other teaching assistants who contribute to the course infrastructure and teaching materials.

UBC Department of Computer Science
Vancouver, British Columbia

Numerical Methods Research Assistant
May 2022 – August 2022

- Created novel discretization technique for solving ill-conditioned instances of the Helmholtz equation in **MATLAB**.
- Developed high-performance finite-element magnetohydrodynamic simulation software using **C++** and **Eigen**.
- Optimized the performance of simulations with millions of degrees of freedom using knowledge of vector calculus.

Kepler Communications
Toronto, Ontario

Software Engineer Intern
January 2021 – August 2021

- Architected and created drivers and a multithreaded **Python** application for the display and keypad on Kepler's next-generation modems.
- Singlehandedly developed new remote software image deployment system capable of supporting the growing number of models in Kepler's constellation of 19 satellites using **Python** and **SQL**.

Skills

Languages	Python, C, C++, Rust, Java, MATLAB, Julia, Racket, Kotlin, C#
Technologies	Git, PyTest, Qt, Django, Flask, Scientific Python, TensorFlow, LaTeX, Bash, CMake, GDB
Technical	Object-Oriented Design, Agile Methodologies, Test-Driven Development, SIL Testing, Data Analysis

Education

University of British Columbia
Vancouver, British Columbia

B.Sc. Combined Honours Computer Science and Physics
September 2019 – April 2024

Major average: 95.5% (4.0/4.0 GPA equivalent).
Honours Thesis Supervisor: Michiel van de Panne.

Projects

Fëanor: MSP430-Based Quadcopter *January 2022 – April 2022*

- Designed and assembled a quadcopter using both stock and 3D-printed components.
- Developed real-time flight-controller software for the TI MSP430 microcontroller, working within its limited 512 bytes of RAM, 16 kilobytes of storage, and 1 MHz clock speed, using **C** and **Assembly**.
- Implemented a proportional–integral–derivative (PID) controller to adjust thrust patterns in response to accelerometer readings to maintain stable flight for over 90 seconds.

Lance: Reinforcement Learning for Competitive Pokémon (GitHub) *July 2021 – Present*

- Created a simulator for Generation I Pokémon battles using **Python**.
- Implemented support for interfacing with both human and computer agents.
- Trained NEAT agents capable of playing a simplified version of the game optimally using self-play.
- Extended the NEAT-Python library to add a **multiprocessing**-based evaluator capable of self-play.

Poor Man's 4090: Ray-Tracing Rendering Engine (GitHub) *November 2022*

- Implemented multithreaded ray tracer using **Rust**, with Rayon for thread pools and nalgebra for vectorized computations.
- Reduced render times in dense scenes by 95% by optimizing collision detection using bounding volume hierarchies.

Au Delà: Natural Language Processing for CS Education (GitHub) *January 2022*

- Interfaced with OpenAI's GPT-3 Davinci Codex autoregressive natural language and source code model to provide AI-powered tools for educators and students in computer science.
- Created suite of AI-powered tools for computer science educators and students by interfacing with OpenAI's GPT-3 Davinci Codex autoregressive natural language and source code model.
- Won "Best Use of GPT-3 API" sponsor prize from OpenAI at nwHacks 2022.

UBC Course Monitor (GitHub) *July 2020 – August 2020*

- Developed a web application to monitor the University of British Columbia's Student Services Centre for open seats in courses in **Python** using **Django** with a **Celery** task queue.
- Built a web scraper to determine a course section's status using the Requests HTTP library, the BeautifulSoup HTML parser, and **regular expressions**.
- Designed accessible frontend using Django templates and **Bootstrap**.
- Deployed application on **Heroku** using a **PostgreSQL** database and **Redis** cache.

Extracurricular Activities

UBC Rocket *Vancouver, British Columbia*

Senior Avionics Team Member *January 2020 – Present*

- Leads development of onboard and ground station software used across numerous rocketry projects to control the functioning of flight-critical and data collection electronics.
- Designed **Qt**-based ground station application in **Python**, using **Matplotlib** for real-time maps and time-series plots.
- Implemented an automated software-in-the-loop **SIL** integration testing suite, to ensure that arming signals would be properly sent from the ground station and acted upon by the firmware, using **PyTest**.
- Saved months of engineering time at the start of each new competition by leading effort to ensure ground station compatibility across differing rocket hardware platforms.

Honours & Awards

Dorothy Gladys Studer Memorial Scholarship *October 2022, November 2023*

Received "on the recommendation of the Department of Physics" for being "the student who [obtained] the highest standing in the third year courses in Honours physics and who is proceeding to the final year of the program."

Dean of Science Scholarship *September 2023*

Received based on the recommendation of the Faculty of Science.

Computer Science Scholarship *October 2022*

Received "on the recommendation of the Department of Computer Science, largely on the basis of academic standing."

Accenture Leadership Award *May 2022*

Received for "[achieving] high academic standing, [demonstrating] leadership, and [participating] actively in extra-curricular or volunteer activities."